

NORTHERN CALIFORNIA BOTANISTS

BOTANICAL LEAFLETS

ISSUE 10

FALL 2012



PRESIDENT'S MESSAGE

It is fall and we have finished our summer field work. There were lots of fires this last summer which reminded me of the summer of 2008. Especially the Chips Fire since it was in the same footprint as the Storrie Fire from 2000. It will be interesting to watch the revegetation of that area.

And after a quick spring wildflower season the sum-

mer was hot at least in the part of the state that I live in! So, the summer wildflowers didn't seem to last as long either.

We have been busy planning our fifth NCB Symposium to be held January 14 and 15, 2013 at California State University, Chico. Workshops will be held on January 16 as well.

The California Botanical Society will hold a reception/mixer in Chico on Sunday evening January 13. It is really going to be a great event!

Have a great fall with your many vast botanical adventures.

Linnea Hanson

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MYSTERY PLANT



Can you identify this plant? This very short plant (usually decumbent) is often less than 5 cm tall; in fact part of its scientific name means 'dwarf.' This densely woolly little summer annual is sometimes quite common within grasslands and open serpentine sites of Northern California. It is found in the northern Central Valley and adjacent foothills of the Sierra Nevada and Cascade Range from 200-900 meters in elevation.

(Answer on Page 3)

2013 NCB SYMPOSIUM!(CONTINUED)

Our **Plenary Presentation** on Monday afternoon will be by **Todd Dawson**, followed by a dedicated **poster session** with poster authors present for questions and discussion. Join us for the **reception** following the poster session for complimentary hors d'oeuvres and a no-host bar. The **Banquet** (not included in registration) will begin at 6:00 p.m. and will be fol-

lowed by the **Keynote Speaker, Dr. Barbara Ertter** of the University of California, Berkeley.

Other Events: Join the **California Botanical Society** on Sunday night prior to the Symposium for an evening of botanical discussion, socializing, and fun. The **CBS Mixer** will be held at the Madison Bear Garden in Chico from 6:00 - 8:30. Pre-register through NCB.

Lunchtime Activities (optional):

- **Student Career Panel**
- **Black Walnut Discussion**

See Page 7 for more information!

Registration for the symposium is now Open! More information can be found on our website at www.norcalbotanists.org

PLENARY PRESENTATION:

The Plenary Presentation will be by Todd Dawson, Professor in the Department of Integrative Biology, University of California, Berkeley.

Todd's talk "From a redwood forest to

TODD DAWSON

a sagebrush steppe? What coast redwoods face under a changing climate" will "take a look back in time to what Redwoods have 'seen' in the past environs they have occupied, what they are 'seeing now' and

how current climate conditions shape their biology and then finally explore what future climate change projections hold for the future of Coast Redwoods and the ecosystems they compose.

KEYNOTE SPEAKER: BARBARA ERTTER TO SPEAK ON A HISTORY OF BOTANY IN CALIFORNIA

Barbara's presentation will be **"People, Plants, and Politics"**. An abstract of her talk is included below.

"The second half of the nineteenth century witnessed the almost overnight transformation of a remote outpost into the bustling metropolis of San Francisco, situated in the midst of an undescribed wealth of biological diversity. This period accordingly also saw the founding and development of most of the major scientific institutions of California: the California Academy of Sciences, the California Geological Survey, the University of California, and Stanford University. As demonstrated by a focus on the

botanical component, the early histories of these institutions are tightly intertwined, with overlapping casts of colorful personalities whose feuds and alliances had seminal influences. Those who exerted the greatest influence on botany during this period were Albert Kellogg, Hans Hermann Behr, Josiah Dwight Whitney, William Henry Brewer, Henry Nicholas Bolander, Mary Katharine Layne Curran Brandegee, Edward Lee Greene, Harvey Willson Harkness, William Russel Dudley, and Townshend Stith Brandegee".

Barbara Ertter served for over two decades as Collections Manager at the Uni-

versity and Jepson herbaria at the University of California in Berkeley, before stepping down from curatorial/administrative responsibilities in 2006. Although now based primarily in home town of Boise, Idaho, she continues pursuing her research interests as Curator of Western North American Flora at UC/JEPS. Among these interests are *Potentilla* and related genera (which she has authored for the Jepson Manual and Flora of North America); floristics of East Bay and other parts of western North America; and the history of California

CALL FOR POSTERS!

The NCB symposium planning committee invites you to bring a poster to share your work and knowledge of the biology, ecology, conservation or management of our Northern California plant life with others at the 2013 Symposium.

A late-afternoon session on Monday, January 14 is a dedicated poster session. Poster authors are requested to be present with posters during this 1-hour session.

Deadline for submitting Poster Abstracts is December 15, 2012. Additional infor-

mation can be found on the website at:

www.norcalbotanists.org/symposia_callforposters.htm

Contact Barb Castro for more information at barbcastro@hotmail.com

NORTHERN CALIFORNIA BOTANISTS IN ACTION

This issue of Leaflets features a continuing series that highlights well-known to possibly less-well-known botanists, with photographs from the present to several decades back. If you have unpublished pictures of Northern California Botanists to share, please send jpegs and relevant information to rschlising@csuchico.edu



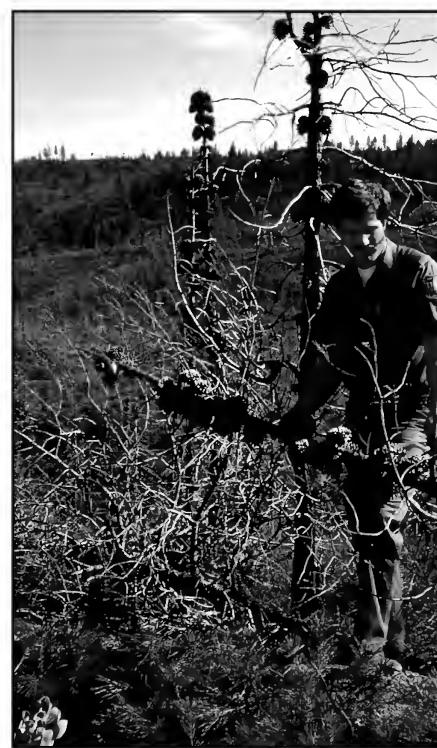
Linnea Hanson in the field for Plumas National Forest, in 1981. She has had over 30 years as an innovative and award-winning botanist with the forest, becoming Forest Botanist, then District Botanist with the Feather River RD. Now retired, she volunteers with environmental organizations and has served as president of the Northern California Botanists since she organized the group in 2006.



Carl Wishner (with wet knees), in a fen near Sagehen Creek with some of his students in a workshop ("Fendango") for Friends of the Herbarium, CSU Chico in August 2012. He is known as an excellent teacher, and is knowledgeable and versatile in many ecological subjects. The book for this workshop was Carl's own, published in 2011 by the U.S. Department of Agriculture, "Bryophytes of Fens in the Northern Sierra Nevada, an Illustrated Field Booklet."



Mike Park in 2011, shown thanking Alicia Martícorena, curator of the herbarium at the Universidad de Concepción in Chile, for access to the collections of *Eryngium*—the subject of his Ph.D. dissertation in the Baldwin Lab, UC/Jepson Herbarium. Mike was one of the speakers (on the Mt. Diablo Buckwheat) in the first "New Discoveries" session in the first Northern California Botanists symposium in 2007.



Dave Isle, now retired after a long botanical career with the Mendocino National Forest, much of it while stationed in Stonyford. He served as Range Conservationist, and later, in Willows, as Forest Botanist. He is shown here in 1980, demonstrating for a class, the features shown by knobcone pine after a forest fire. Dave now enjoys some botanical consulting and getting after feral pigs.

2012-2013 STUDENT RESEARCH SCHOLARSHIP AWARDS

An important mission of the Northern California Botanists is to promote botany and plant ecology research. For the past five years, we have awarded \$1000 scholarships to college and university students doing research on botanical subjects in northern California (see our webpage for the geographic range defining the NCB area of interest).

For the 2012-2013 school year, we again received many worthy applications and awarded seven proposals, one of which included a 2-person undergraduate research team. NCB would like to share the research abstracts of this years recipients.



Jennifer Balachowski is a PhD student at the University of California, Davis, shown here at a field site at Fort Ord Natural Reserve.

The title of her research is

“Restoring for the future: evolutionary ecology of *Elymus glaucus*, and composite provenancing as a tool for native grassland restoration”.

Over the next 100 years, grasslands in California will experience warmer temperatures, shifts in annual and seasonal water availability, and an increase in extreme events like severe droughts. Restoring native species to these systems will require novel management strategies that encourage ongoing adaptation in response to rapid environmental change. Establishing restored grassland populations that are well adapted to their environments today, but not compromised in their abilities to evolve to meet future climate demands is a challenging task, particularly because the evolutionary ecology and genetic architecture of most native species is poorly understood. The use of composite provenances (blends of current and potentially future-adapted ecotypes) is one strategy that may boost evolutionary potential in restored populations without reliance on scarce species-specific genetic data. However, it may also result in increased genetic load or negative demographic consequences due to the inclusion of maladapted ecotypes. Furthermore, when restored populations are sourced from composite provenances, ecotypes from different regions will interact with one another in potentially novel environmental settings. Both life history theory and community ecology offer insights into how these interactions may play out, but few studies have explicitly quantified how both intraspecific interactions and the abiotic environment influence demographic processes and evolutionary trajectories at the population level. This study uses a reciprocal transplant experiment to empirically test how environment and inter-ecotype interactions influence population vital rates and the expression of local adaptation in *Elymus glaucus*, a native bunchgrass and key restoration species in Northern California.



Jens Stevens is a PhD student at the University of California, Davis.

The title of his research is

“Interacting effects of snowpack, fire and forest management on plant invasions in the Sierra Nevada”.

This research seeks to understand how interactions between snowpack levels, fire, and forest structure might affect the invasion of the exotic shrubs *Cytisus scoparius* (Scotch broom) and *Spartium junceum* (Spanish broom) to higher elevations in the Sierra Nevada that are currently uninvaded. I will be manipulating snowpack levels in plots that will receive seed additions of both *Cytisus* and *Spartium*, to investigate whether reduced or increased snowpack might facilitate earlier germination, and increased growth, reproduction and survival in either or both species. These manipulations are being carried out in areas that are to receive prescribed fire, as well as fire-free areas, to study how fire might interact with changes to snowpack and associated changes in soil moisture. I will also examine how forest density interacts with these factors to influence broom establishment. By examining the constraints on broom population distributions in the Sierra Nevada, I will be able to assess the likelihood of invasion under a range of future environmental conditions in the region, and the extent to which environmental factors versus propagule limitation contribute to the current distribution limits of these invasive species.

2012-2013 STUDENT RESEARCH SCHOLARSHIP AWARDS

Brett Smith is a Master's student at the University of California, Santa Cruz.

The title of his research is "**Gene flow and hybridization in a rare, serpentine endemic *Monardella***".



Small and patchily distributed populations are at increased risk for extinction through inbreeding and the loss of genetic diversity. Habitat disturbance and environmental change can exacerbate these genetic effects, fixing a species along a trajectory towards extinction. Gene flow is one of the primary mechanisms for the maintenance of adaptive evolutionary potential in the face of increased environmental variance and disturbance. In rare species, gene flow can mitigate the effects of inbreeding in small populations through genetic rescue, but has also been associated with the introduction of maladaptive alleles into locally adapted populations and assimilation of rare taxa into congeners. Quantifying gene flow and genetic structure using conservation genetic techniques is especially useful in the management and conservation of rare species. I plan to use conservation genetics to quantify the extent and depth of introgression in two rare *Monardella* plants and two common congeners in Plumas National Forest.

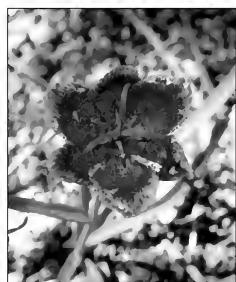
Monardella follettii and *Monardella stebbinsii* (Lamiaceae) are strict edaphic endemics with a distribution limited to the northern end of the Sierra Nevada where a belt of serpentine bedrock has given rise to extensive serpentine soil habitat. These two serpentine endemics face unique challenges to survival, including two major fires in their limited ranges within the last 15 years and very small populations isolated by up to several kilometers. Both species are represented by only a small number of known populations, fewer than 15 for *M. stebbinsii* and fewer than 25 for *M. follettii*, and are listed as critically imperiled and imperiled respectively by CNPS. Further, the plants seem to be hybridizing with nearby widespread congeners *M. sheltonii* and *M. odoratissima*. My specific objectives are 1) Identify and quantify the extent of introgression among taxa in the *Monardella* genus in Plumas National Forest 2) combine these data with previously collected soil and ecological data to identify environmental factors that are correlated with the presence of hybrid zones 3) synthesize these data into recommendations for management and conservation of the rare, serpentine endemic taxa.



Sean Ryan is a Master's student at San Diego State University.

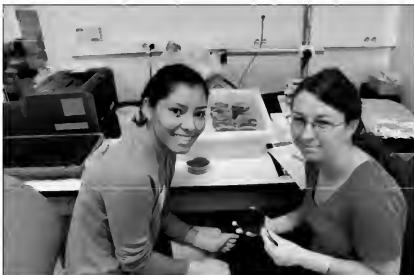
The title of his research is "**Molecular phylogeny and character evolution of *Fritillaria* subgenus *Liliorhiza* (Liliaceae)**".

Sean Ryan collecting *Fritillaria recurva* in the North Coast Ranges (above) and *F. pinetorum* from south Sequoia National Park (below).



Fritillaria subgenus *Liliorhiza* (Liliaceae) is an attractive group of mostly North American geophytes whose evolutionary history has not been fully explored. A majority of species are distributed in central and northern California, several are CNPS listed, and most have restricted geographic distributions. Abundant synonymy and inconsistent species delimitation need to be addressed in order to make appropriate conservation decisions regarding rare taxa in the group. The most extensive molecular phylogenetic study to date included only 12 of the approximately 20-25 species in the subgenus and showed little interspecific resolution, probably due to recent rapid speciation. The two most recent morphology-based classifications need to be supplemented with further morphological and molecular study. This study aims to determine phylogenetic relationships of all described taxa in the group, to evaluate taxonomic classifications (including questionable species and varieties), and to explore morphological character evolution. To accomplish these goals, I have collected several specimens per taxon, sequenced the chloroplast rpl16 intron and nuclear ribosomal ITS and ETS. I will present the results of several molecular phylogenetic analyses and ancestral character state reconstructions of bulbs, tepal nectaries, and leaf arrangement.

2012-2013 STUDENT RESEARCH SCHOLARSHIP AWARDS



Juliana Moreno (left) and **Leena McCann** (right) are undergraduate students at Santa Clara University.

The title of their research is
“Sympatric Speciation in Northern California Columbines”.



Aquilegia formosa

Adaptation and speciation are central concepts in evolutionary biology, yet the role of natural selection during speciation is hotly debated. In order to study this, one can look to sympatric speciation where reproductive isolation evolves through diversifying selection in the face of gene flow. Sympatric speciation is the process in which one species forms two distinctive species while living in the same geographic area. Adaptation of plants to unique soil types, like serpentine soils in California, provides a window into the process of sympatric speciation since plants often evolve from adjacent non-serpentine habitats.

In the southern San Francisco Bay Area, two species of columbines (*Aquilegia formosa* and *A. eximia*) can be found growing adjacent to each other. One of these species (*A. eximia*) has recently adapted to survive on serpentine soil. We determined these two species are uniquely adapted to their soil types by comparing the first stages of growth in a reciprocal transplant experiment involving both serpentine and non-serpentine soils. Although germination rates did not differ widely, we found that all *A. formosa* individuals died when planted on serpentine soil. *Aquilegia eximia* was capable of growing on both soil types. Furthermore, we have begun to examine the gene flow between the two species by using microsatellites. Examining one microsatellite so far, we have obtained preliminary results and have observed that *A. formosa* has greater allelic richness than *A. eximia*, the alleles detected in *A. eximia* are a subset of those in *A. formosa*, and that *A. eximia* has dramatically lower heterozygosity than *A. formosa*. We plan to further study the gene flow between these two species by examining at least five more microsatellites in one hundred and eighty individuals from each of the two populations.



Elymus glaucus © 2012 Margo Bors

Meghan Parish is a Master’s student at Sonoma State University.

The title of her research is **“Functional traits, disturbance, and invasion: do native and exotic perennial grasses differ in response to season of mowing and herbicide in an invaded California grassland?”**

Declines in both native biodiversity and ecosystem function have led to extensive research to identify the factors that control plant invasions. Over the past two centuries, exotic species have transformed California grasslands from communities once dominated by native perennial bunchgrasses and annual wildflowers, to systems invaded by exotic annual grasses and forbs. More recently, exotic perennial grasses have begun successfully invading California grasslands and pose a major threat to these already imperiled communities. One such species rapidly-spreading throughout California is Harding grass, *Phalaris aquatica*, and has been identified by the Cal-IPC as a moderate threat to wildlands. Although several studies have explored interactions between exotic annual and native perennial grasses in response to disturbance, few studies have examined the relationship between more functionally-similar native and exotic perennial grasses. Using greenhouse and field experiments, I propose to compare the recruitment dynamics of Harding grass and blue wildrye (*Elymus glaucus*), a native perennial grass commonly used in restoration, and their individual responses to standard grassland restoration techniques, seasonal mowing and herbicide application. As Harding grass continues to spread, it will be essential for land managers to have tools that do not cause further harm to the resident native species. This study will lead to a better understanding of how these restoration techniques can be used to control an exotic invader, while also concentrating on how to exploit differences in functional traits across life stages to promote successful re-establishment of a similar native bunchgrass species and the native plant community as a whole.



Phalaris aquatica © 2005 Brianna M. Richardson

2012-2013 STUDENT RESEARCH SCHOLARSHIP AWARDS



Lee Ripma is a Master's student at San Diego State University.

The title of her research is **“Testing the genome skimming method in Cryptanthinae: a technique to provide resolution in *Oreocarya*.”**

California is home to at least 15 species of *Oreocarya* (Boraginaceae), including two undescribed species, six California endemics and five species listed in the CNPS rare plant inventory. *Oreocarya* species are separated by slight differences in the fruit (“nutlet”) morphology and are often difficult to identify. Past studies have used traditional molecular methods and had limited success in resolving backbone relationships within the genus. The objective of this project is to create a preliminary molecular phylogeny of *Oreocarya* using Next Generation Sequencing. The study will employ the genome skimming method to assemble complete plastid and nuclear ribosomal DNA sequences for phylogenetic inference. In addition, the study will focus on resolving the morphologically defined *Oreocarya* nubigena group, a complex of species occurring on montane to alpine granitic or volcanic substrates of California, Oregon, Idaho and Montana. The nubigena group has been a source of confusion for botanists with changing circumscription and species limits over the last 100 years. This study will test the feasibility of the genome skimming method to resolve relationships within genera of the subtribe Cryptanthinae. A preliminary phylogeny of *Oreocarya* will be employed to revise current taxonomic treatments, trace character evolution, and elucidate the evolutionary history of some of California’s range-restricted endemic species.



Oreocarya nubigena outside Mammoth, CA

2013 SYMPOSIUM—LUNCHTIME DISCUSSIONS

Join our optional discussion forums during the Monday and Tuesday Lunch Breaks. Lunch will be available to purchase at the Marketplace Café in the BMU prior to the events.

Monday—Student Career Panel

Attention students! Are you curious about what awaits you on the other side of your diploma? Come to the NCB 2013 Student Career Panel to find out! This free, lunchtime event will bring together a panel of

botanists who work for a variety of different employers, including the federal government, local government, a non-profit organization, and a private company. Panelists will describe their jobs in detail, providing insight into the daily life of a botanist at their respective organizations. Students will then have the opportunity to ask questions of the panelists. Both undergraduates and graduate students are welcome, and panelists will provide information for students at all levels.

Tuesday—What to Make of Walnuts?

During the nineteenth and twentieth centuries, the distribution of northern California black walnut (*Juglans hindsii*) changed from restricted to wide ranging; and along the way, these trees acquired some nonnative ancestors. This brownbag will be a group discussion on the implications of these changes for management practices.

STIPENDS FOR COLLEGE STUDENTS—2013 SYMPOSIUM

Northern California Botanists will provide a number of stipends to help cover expenses of travel, lodging, meals, and registration for current college students who wish to attend the NCB symposium in January 2013.

Requirements:

- 1) Must register for the NCB symposium by December 14, 2012
- 2) Must be a current college student
- 3) Must provide evidence of interest or involvement in plant sciences.

Applications must be received by Dec. 14, 2012. Apply early! Recipients will be notified in late December.

More information and the application form can be found on our website or email Daria Snider at dsnider@ecorpconsulting.com



NORTHERN CALIFORNIA BOTANISTS

P. O. Box 8042
Chico, CA 95927-8042

Registration is now open
for the 2013 Symposium.
Check out details inside the
newsletter!

www.norcalbotanists.org

MEMBERSHIP APPLICATION/RENEWAL

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City: _____ State: _____ Zip: _____

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MEMBERSHIP DUES:

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In addition, I would like to donate \$_____ to Northern California Botanists
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